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ANTARCTIC RESEARCH EXPEDITION

1929-1931

UNDER THE COMMAND OF SIR DOUGLAS MAWSON, Kt., O.B.E., B.E., D.Sc., F.R.S.

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VOLUME VIII

PART 4

CEPHALOPODA

By

R. K. DELL

ADELAIDE

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	Part 2.	CUMACEA AND NEBALIAACEA, <i>by H. M. Hale</i> (1937) - - - - -	3	6
	Part 3.	DIPTERA, <i>by H. Womersley</i> ; MISCELLANEOUS INSECTA, <i>by H. Womersley</i> ; LEPIDOPTERA, <i>by H. Womersley and N. B. Tindale</i> (1937) - - - - -	4	6

(Continued on inside back cover.)

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PART 4

CEPHALOPODA

By

R. K. DELL

[B.A.N.Z.A.R.E. Reports Series B, Vol. VIII, Part 4, pp. 89-106,
Table 1, text figures 1-10.]

Issued November, 1959

CONTENTS

	PAGE
INTRODUCTION - - - - -	91
LIST OF COLLECTING STATIONS - - - - -	91
LIST OF SPECIES IDENTIFIED - - - - -	91
DESCRIPTIONS OF SPECIES - - - - -	92
CEPHALOPODS AS FOOD OF VERTEBRATES - - - - -	101
DISCUSSION - - - - -	102
LITERATURE - - - - -	105

CEPHALOPODA

by

R. K. DELL*

(Table 1, Figs. 1-10.)

(Submitted for publication, December, 1958.)

INTRODUCTION.

Through the courtesy of the late Sir Douglas Mawson I have been given the opportunity of examining the B.A.N.Z.A.R. Expedition collection of cephalopods. Though a small collection, the specimens were usually beautifully preserved, except of course for those damaged in the trawl or otherwise fragmentary when collected. As seems usual in Antarctic expeditions, some additional specimens were collected outside the Antarctic Zone proper. These specimens supply some very useful distributional data, especially for the South Indian Ocean. Until more such collections are available, the distribution patterns of the Antarctic cephalopods, especially of pelagic forms, cannot be properly interpreted. In addition a well-documented collection of stomach contents demonstrates again how important the cephalopods are as food for vertebrate animals in the Antarctic. Additional information on the stations and gear used is given in Johnston (1937).

COLLECTING STATIONS CONCERNED IN THIS REPORT.

Station 27: 64° 32' S., 75° 55' E., N 200 H 1000 m.
Station 30: 66° 48' S., 71° 24' E., TML, 456 m.
Station 32: 66° 35' S., 61° 13' E., N 200 H, 750 m.
Station 39: 66° 10' S., 49° 41' E., TML, 300 m.
Station 45: 63° 51' S., 54° 16' E., N 200 H, 2000 m. warp.
Station 47: 49° 50' S., 69° 33' E., DRL, 150 m.
Station 64: 49° 28' S., 70° 33' E., OTL, 91 m.
Station 69: 43° 19' S., 93° 56' E., N 200 H, 3000 m. warp; N 100 H, 1000 m. warp.
Station 71: 51° 59' S., 98° 59' E., N 100 H, 1200 m. warp with N 200 H on 4200 m. warp.
Station 73: 38° 33' S., 109° 22' E., N 200 H, 1000 m. warp.
Station 90: 66° 21' S., 138° 28' E., DRL, 640 m.
Station 91: 64° 49' S., 124° 58' E., N 70 V, 750-500 m.
Station 93: 64° 21' S., 116° 02' E., TM, 2267 m.; N 200 H, 1500 m. warp.
Station 96: 65° 10' S., 109° 32' E., N 200 H, 1160 m.; N 100 B, 93 m.
Station 107: 66° 45' S., 62° 03' E., DRL, 177 m.
Station 111: 44° 11' S., 143° 36' E., N 200 H, 1710 m.
Station 113: 42° 40' S., 148° 27' 30" E., OTL, 122 m.

Abbreviations used for collecting gear in this list are: N 70, N 100, N 200, townets with mouth rings respectively 70, 100, and 200 cms. in diameter; H, V, or B, indicating horizontal, vertical, or oblique haul; TM, Monagasque trawl; TML, large Monagasque trawl; OTL, large otter trawl; DRL, large rectangular dredge.

SPECIES IDENTIFIED.

										PAGE
OCTOPODIDAE										
<i>Pareledone harrissoni</i> (Berry)	-	-	-	-	-	-	-	-	-	92
<i>P. adeliانا</i> (Berry)	-	-	-	-	-	-	-	-	-	92
<i>P. charcoti</i> (Joubin)	-	-	-	-	-	-	-	-	-	93
<i>Robsonella australis</i> (Hoyle)	-	-	-	-	-	-	-	-	-	95
<i>Benthoctopus</i> sp.	-	-	-	-	-	-	-	-	-	95
BRACHIOTEUTHIDAE										
<i>Brachioteuthis picta</i> Chun	-	-	-	-	-	-	-	-	-	96
ALLUROTEUTHIDAE										
<i>Alluroteuthis antarcticus</i> Odhner	-	-	-	-	-	-	-	-	-	96
CRANCHIIDAE										
<i>Taonidium suhmi</i> (Hoyle)	-	-	-	-	-	-	-	-	-	97
<i>Crystalloteuthis glacialis</i> Chun	-	-	-	-	-	-	-	-	-	97
<i>Teuthowenia antarctica</i> Chun	-	-	-	-	-	-	-	-	-	98
HISTIOTEUTHIDAE										
<i>Calliteuthis miranda</i> Berry	-	-	-	-	-	-	-	-	-	100
<i>Histioteuthis bonellii</i> Ferussac	-	-	-	-	-	-	-	-	-	101

* Dominion Museum, Wellington, New Zealand.

DESCRIPTIONS OF SPECIES.

Family OCTOPODIDAE.

Genus PARELEDONE Robson, 1932.

Type: (o.d.) *Eledone charcoti* Joubin.

The species of *Pareledone* and of the closely allied genera *Graneledone*, *Bentheledone* and *Thaumeledone* form one of the most characteristic elements of the Antarctic cephalopod fauna. Knowledge of their systematics is however, obviously still at a rather elementary stage. Robson's account (1932, pp. 270-321) must be regarded as provisional, a fact that Robson himself implied in his comments on some of the species.

Three species are poorly known and subsequent identification of other specimens with *P. turqueti* (Joubin), *P. antarctica* (Thiele) and *Graneledone setebos* Robson has, and will, prove difficult. Males are also unknown for *Pareledone adeliana* (Berry).

The relative importance and stability of certain morphological features has not yet been adequately assessed, even those major features which have been used in discriminating species. The values to be placed on the presence or absence of a peripheral fold, the relative strength or absence of surface papillae or granules and the constancy of radular features are amongst those that must be decided before the systematics can be placed upon a firm basis.

In addition most species are very incompletely described, such useful accessory diagnostic features as the number of gill filaments being unrecorded in many cases.

The present collection cannot help solve many of these problems but it can add appreciably to our knowledge of some of the forms.

PARELEDONE HARRISSONI (Berry, 1917)

(Figures 1-3.)

Moschites harrissoni Berry, 1917, p. 24.*Pareledone harrissoni* Robson, 1932, p. 277.

TYPE LOCALITY: Off the Shackleton Ice Shelf in 325 fathoms (also recorded by Berry from two other stations off the Shackleton Ice Shelf).

BANZARE LOCALITIES: Stations 39, 107.

Berry's specimens were all females. The BANZARE material consists of two large males. These latter two specimens agree with Berry's description of *P. harrissoni* in having a well-marked subperipheral fold, a smoothish body with scattered but definite papillae, and in having a funnel organ just as described and figured by Berry. The radula of the specimen from Station 107 differs from that drawn and described by Berry in a number of particulars. The rhachidian tooth has a blunt mesocone with two asymmetrically arranged lateral cusps on each side as compared with a sharp mesocone with a single lateral cusp situated low down in Berry's specimen. The other teeth agree rather well with Berry's figure. The details of the rhachidian tooth vary considerably and slight tilting of the radula on the slide alters the observed outline. The apparent difference between the rhachidian teeth in the BANZARE and Berry's specimens should not therefore be given too much significance.

Both the BANZARE specimens are males so that some details of the male organs may now be added to Berry's account of the female. The hectocotylus is of medium size, the ligula moderately developed and rather flat with a series of transverse grooves running across it. The male reproductive system (fig. 3) is best compared with Massy's (1916) account of *P. charcoti*. The ejector is considerably larger than in *P. charcoti* with a very large semi-spiral diverticulum at the base. Needham's sac is very well developed. The vas deferens is long and narrow. In general, however, there is close agreement with *P. charcoti* in the disposition, shape and relationships of the various organs. As is noted later, however, the BANZARE specimens of what is presumed to be *P. charcoti* have a very much larger diverticulum than that shown by Massy. Spermatophores of *P. harrissoni* are very large. There was a single spermatophore coiled in the diverticulum. This was so brittle that it could not be removed in one piece, much less straightened. It is, however, at least 120 mm. long.

Berry recorded this species from the Shackleton Ice Shelf between 96° and 98° E. The BANZARE collections extend this range from 49° to 98° E., in depths from 177 to 358 metres. Measurements and indices of the BANZARE specimens are given in Table 1.

PARELEDONE ADELIANA (Berry, 1917).

(Figure 7.)

Moschites adeliana Berry, 1917, p. 17.*Pareledone adeliana* Robson, 1932, p. 278.

TYPE LOCALITY: 66° 55' S., 145° 21' E., off the Mertz Glacier Tongue, Adelie Land in 288-300 fathoms.

BANZARE LOCALITIES: Stations 30, 39.

This species was described by Berry from a single female specimen and two juveniles and does not appear to have been recorded since. Two BANZARE specimens agree with this species better than with any

other described form. The specimen from Station 39 has been somewhat damaged and the skin on the mantle and the web is considerably torn and distorted. Several of the arms in the specimen from Station 30 are damaged. This specimen has a well developed subperipheral fold and there are traces of a similar fold in the other, damaged specimen. Berry's type of *P. adeliانا* lacked this feature and this is the only major character by which the BANZARE specimens differ.

The arms are comparatively short, the eyes relatively enormous, the funnel organ is W-shaped and the surface lacks any papillae or tubercles. The radula (fig. 7) is closer to that of *adeliana* as figured by Berry than to any other form. In some respects these two specimens approach *Pareledone polymorpha* (Robson). They agree with this rather diffusely characterised form in the shape of the funnel organ, presence of a peripheral fold and to a certain extent in the radula. They do not, however, have the "rather widely spaced small granules" of *P. polymorpha* and have only six gill filaments as opposed to the 10-17 of that species. The number of gill filaments is not known for *P. adeliانا*. It is therefore with some hesitation that these specimens are included in *P. adeliانا*. Apart from the presence of a peripheral fold, they do agree more closely with this species than with any other and the presence or absence of the peripheral fold in one specimen (even if it is the type) may be due to an accident of preservation. In the present state of our knowledge of these forms these specimens seem best classed as *P. adeliانا*.

The range of *P. adeliانا* can now be increased to between 49° E. and 146° E., in depths from 288 to 540 metres. Measurements and indices of the BANZARE specimens are given in Table 1.



Figs. 1-3. *Pareledone harrissoni* (Berry). 1. Hectocotylus of specimen from Station 39; 2. Radula, Station 107; 3. Male reproductive system, Station 107.
Figs. 4-6. *Pareledone charcoti* (Joubin). 4. Hectocotylus of specimen from Station 30; 5. Radula, Station 30; 6. Male reproductive system, Station 30.
Fig. 7. *Pareledone adeliانا* (Berry), radula.

PARELEDONE CHARCOTI (Joubin, 1905).

(Figures 4-6.)

Eledone charcoti: Joubin 1905, p. 22; 1914, p. 35; Odhner, 1923, p. 6.

Moschites charcoti Hoyle, 1912, p. 279; Massy, 1916, p. 151.

? *Moschites aurorae* Berry, 1917, p. 20; 1918 (post script).

Graneledone charcoti: Joubin, 1924, p. 38; Robson, 1930, p. 388.

Pareledone charcoti: Robson, 1932, p. 270.

TYPE LOCALITY: Booth Wandel Island, South Shetlands.

BANZARE LOCALITIES: Stations 30, 90, 93, 107.

A number of BANZARE specimens agree best with *P. charcoti* although they do not agree completely with other specimens that have been recorded as this species in the literature. The BANZARE specimens are strongly tuberculate dorsally, the line of demarcation between the tuberculate dorsal, and the comparatively smooth ventral surfaces very clearly defined in most cases. This line of demarcation is sometimes drawn up to form a low peripheral fold.

The third right arm is hectocotylised in the male. Hectocotylus thick and fleshy, ligula with wide lips and no trace of regular transverse grooves or ridges. Radula (fig. 5) with unicuspid rhachidian teeth set on a semi-circular base, first laterals comparatively large for the group, second and third laterals well developed. The rhachidian teeth are more like Berry's drawing of *Moschites aurorae* than Massy's of *P. charcoti*. The BANZARE specimen (Station 30) differs from Berry's figure and description of *P. aurorae* in having no lateral cusps low down towards the base. Massy's drawing of the radula of "Terra Nova" specimens of *P. charcoti* shows rhachidian teeth with two or three lateral cusps on each side.

The funnel organ of the BANZARE specimens agrees very closely with Berry's figure for *P. aurorae* (= *P. charcoti*). The male reproduction system (fig. 6) agrees quite well with Massy's account of *P. charcoti*, but the ejector ("penis") and diverticulum ("pouch-like dilatation") are very much larger in comparison.

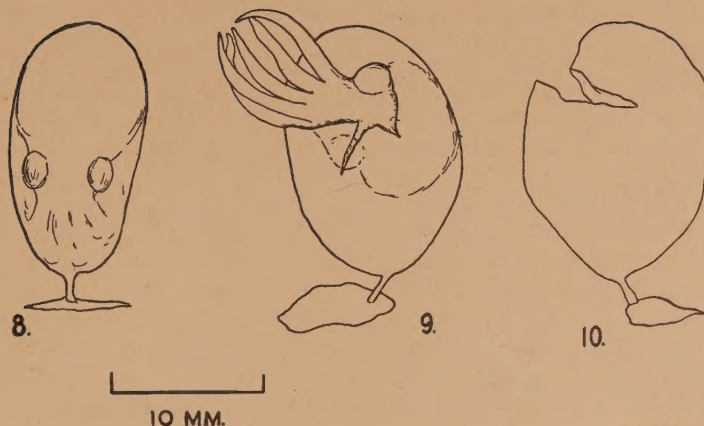
Measurements and indices of three specimens are given in Table 1.

TABLE I.
Measurements and indices for *Pareledone* spp.

	<i>Pareledone harrissoni</i>		<i>Pareledone adeliانا</i>		<i>Pareledone charcoti</i>		
Station No.	39	107	39	30	90	90	30
Sex	Male	Male	Female	Female	Female	Male	Male
Total length	253 mm.	336 mm.			96 mm.	83 mm.	73 mm.
Dorsal mantle length	66 mm.	78 mm.	37 mm.	43 mm.	37 mm.	32 mm.	28 mm.
Mantle width	60 mm.	71 mm.	29 mm.	28 mm.	27 mm.	28 mm.	25 mm.
Interocular width	41 mm.	51 mm.	30 mm.	32 mm.	21 mm.	28 mm.	20.5 mm.
R.1.	145 mm.	215 mm.	69 mm.	57 mm.	46 mm.	39 mm.	40 mm.
R.2.	123 mm.	125 mm.	80 mm.	59 mm.	50 mm.	43 mm.	44 mm.
				52 + mm.	54 mm.	40 mm.	42 mm.
R.3.	132 mm.	191 mm.	100 mm.	{ L. 62 mm.			
				{ 50 + mm.	{ 38 + mm.	46 mm.	39 mm.
R.4.	182 mm.	248 mm.	91 + mm.	{ L. 60 mm.	{ L. 45 mm.		
Diam. largest sucker	6.0 mm.	7.0 mm.	4.0 mm.	3.0 mm.	3.0 mm.	2.3 mm.	2.0 mm.
Web A.	36 mm.	60 mm.	—	19 mm.	16.5 mm.	18 mm.	16 mm.
B.	40 mm.	50 mm.	—	21 mm.	20.5 mm.	17 mm.	17 mm.
C.	45 mm.	55 mm.	—	15 mm.	19 mm.	18 mm.	21 mm.
D.	45 mm.	60 mm.	—	22 mm.	17 mm.	23 mm.	17 mm.
E.	35 mm.	57 mm.	—	19 mm.	14 mm.	18 mm.	13 mm.
Length of Ligula	7.0 mm.	7.5 mm.	—	—	—	4.5 mm.	3.0 mm.
Gill Filaments	—	8	6	6	—	5	—
Median funnel length	—	31 mm.	14.5 mm.	11 mm.	16 mm.	14 mm.	12 mm.
<i>Indices</i>							
Mantle length A.	66	78	37	43	37	32	28
Mantle Index B.	91	91	78	65	73	88	82
Interocular Index C.	62	65	81	74	57	88	73
Arm Formula D.	4132	4132	3421	3421	3214	3421	2314
Arm Index E.	73	76	73	59	59	60	61
Sucker Index G.	9	9	11	7	8	7	7
Web Formula H.	D=C.B.A.E.	D=A.E.C.B.	—	D.B.E.=A.C.	B.C.D.A.E.	D.A.=C.= E.B.	C.B.=D.A.E.
Web Index J.	25	26	—	35	38	48	48
Ligula Index K.	5	4	—	—	—	11	7

Pareledone Egg Capsules.

From Station 39 a number of stalked eggs and newly hatched young octopods were obtained. In a few cases the eggs actually hatched aboard ship. The eggs are large, oval, 15.5 mm. long without the stalk and 8.5 mm. in diameter. They were attached by the stalks to Bryozoa, shells, etc. Two species of *Pareledone* were collected at Station 39, *P. harrissoni* Berry and *P. adeliانا* Berry. The newly hatched specimens are Eledonids but they lack a peripheral fold. *P. harrissoni* in the adult has a well-marked peripheral fold and the BANZARE specimens of *P. adeliانا* from this station also possess a fold. It is not known, however, at what stage the peripheral fold develops in *Pareledone* and whether it is present from birth or not. When hatching takes place the egg capsule splits peripherally at about the upper third, the embryo rotates until the arms can be pushed through the slit, and the body is then levered out. (Figs. 8-10.)



Figs. 8-10. Three separate egg cases from Station 39.

Genus ROBSONELLA Adam, 1938.

Type (o.d.) *Octopus fontanianus* d'Orbigny.

ROBSONELLA AUSTRALIS (Hoyle, 1885).

Octopus australis Hoyle, 1885, p. 224; 1886, p. 88; Robson, 1929, p. 144; Cotton and Godfrey, 1940, p. 447.*Polypus campbelli* Smith, 1902, p. 201; Suter, 1913, p. 149.*Polypus* cf. *australis* Berry, 1918, p. 276.*Joubinia campbelli* Robson, 1929, p. 145, p. 190.*Robsonella campbelli* Adam, 1938, p. 223.*Robsonella australis* Benham, 1942, p. 227; Dell, 1952, p. 32; Pickford, 1955, p. 163.

TYPE LOCALITY: Port Jackson, Australia.

BANZARE LOCALITY: Station 113. A half digested specimen from the stomach of a fish from the same station probably belongs to this species also.

Genus BENTHOCTOPUS Grimpe, 1921.

Type: *Octopus piscatorum* Verrill.

BENTHOCTOPUS sp.

BANZARE LOCALITIES: Stations 47, 64.

A very small specimen from Station 47 and a small, badly preserved specimen from Station 64 are of interest in that both have the suckers on the arms arranged biserially in contrast to the uniserial arrangement of the true Antarctic Eledonids. The only cephalopod previously recorded from near Kerguelen is *Benthoctopus thielei* Robson described from two shore-collected (?) specimens. An allied form *B. levis* (Hoyle) was described from off Heard Island in 75 fathoms. The larger BANZARE specimen is the only one worth comparing with these. The Arm Index is comparable (78) but the Web Index (18) is considerably lower than in either *B. thielei* or *B. levis*. Unfortunately the BANZARE specimen is not well preserved internally and the number of gill filaments cannot be counted. In addition the viscera are so damaged that it is impossible to be certain that there is no ink sac. There does not appear to be one and the specimen would therefore be best placed in *Benthoctopus*. The specimen is, however, small and damaged and there can be no finality in its determination.

Measurements of BENTHOCTOPUS sp.

Station	-	-	-	47
Mantle length	-	-	-	12.5 mm.
Mantle width	-	-	-	distorted
Interocular width	-	-	-	8.5 mm.
Arms	R.1	-	-	45 mm.
	L.2	-	-	44.5 mm.
	R.3	-	-	43 mm.
	R.4	-	-	46 mm.
Web	A	-	-	6 mm.
	B	-	-	7 mm.
	C	-	-	8.5 mm.
	D	-	-	7.5 mm.
	E	-	-	damaged

Family BRACHIOTEUTHIDAE.

Genus BRACHIOTEUTHIS Verrill 1881.

Type: *Brachioteuthis beanii* Verrill.

BRACHIOTEUTHIS PICTA Chun, 1910.

Brachioteuthis picta Chun, 1910, p. 207.

TYPE LOCALITY: 5° 6' N., 9° 58' W., in the northern extremity of the Benguela Current, vertical net from 1500 metres.

BANZARE LOCALITY: Station 69 (N 200 H).

The single BANZARE specimen from Station 69 agrees very well with Chun's description and figures of *Brachioteuthis picta*. The head is not so wide as in Chun's specimen but the BANZARE specimen is considerably larger and such differences in proportion may well be due to growth changes. The colour note on the label reads: "general: pale, transparent, colourless with mottled reddish brown markings on envelope, body and basal parts of arms, and tip of long arms."

I have seen no records of this species since its original description so that the known geographical range of the species is considerably enlarged by this collection.

Total length	-	-	110 mm.
Dorsal mantle length	-	-	48 mm.
Ventral mantle length	-	-	42 mm.
Mantle width	-	-	11 mm.
Length of fins	-	-	28 mm.
Width across fins	-	-	27 mm.
Length of body to base of arms			59.5 mm.
Head length	-	-	11.5 mm.
Width across eyes	-	-	9 mm.
Sessile arms R.1	-	-	14 mm.
R.2	-	-	25 mm.
R.3	-	-	23 mm.
R.4	-	-	19 mm.
Tentacles T.L.	-	-	52 mm.
Length of left tentacle club			11 mm.
Length of funnel (median)			6 mm.

Family ALLUROTEUTHIDAE.

Genus ALLUROTEUTHIS Odhner, 1923.

Type: *Alluroteuthis antarcticus* Odhner.

ALLUROTEUTHIS ANTARCTICUS Odhner, 1923.

Alluroteuthis antarcticus Odhner, 1923, p. 2; Thiele, 1934, p. 970.? *Parateuthis tunicata* Thiele, 1921, p. 463.

TYPE LOCALITY: Weddell Sea in net fished from 2800 metres to the surface.

BANZARE LOCALITIES: Stations 27 (N 200 H), 32 (N 200 H), 45 (N 200 H).

Odhner had only two specimens from the Weddell Sea, the largest 28 mm. in total length. The BANZARE specimens are all about this length and agree with Odhner's description and figures very well. But in none of the eight certainly identifiable BANZARE specimens can the writer find any sign of a row of light organs on the inner face of the ventral arms, alongside the double row of suckers. Perhaps Odhner mistook some other surface feature for light organs in his two specimens or perhaps this area has been sufficiently damaged in all the BANZARE specimens to destroy the evidence of such features. It must be admitted, however, that the inner face of the arms is an unusual position for a row of light organs.

If these light organs do not exist in this species, then the systematic position of the family which consists solely of this species must be re-considered. Odhner seems to have separated *Alluroteuthis* on this row of light organs, the structure of the pen and the method of attachment and general relationships of the fins and body. These features must be evaluated when the higher classification of the squid genera is next revised. In view of the uncertainty about the actual presence of light organs in the type specimen, the question will not be pursued further at present.

Two specimens in the BANZARE collection, a small specimen 16 mm. in mantle length from Station 96 and a very small specimen from Station 45 agree very well with specimens of *Alluroteuthis antarcticus* but differ in having tentacles developed to a more normal extent and in having very large, close-packed,

lozenge-shaped chromatophores especially on the dorsal surface of the mantle. There is every possibility that the specimens of *Alluroteuthis antarcticus* so far obtained are all juveniles. These other two specimens fall within the size range of *A. antarcticus* so that they probably represent another species. Under the circumstances the writer does not think it wise to describe this form.

Odhner (1923, p. 4) has suggested that the juvenile form described by Thiele (1921, p. 463) as *Parateuthis* (n.gen.) *tunicata* is in fact a juvenile *Alluroteuthis*. This is just another example of the complex tangle that has arisen in the oegopsid cephalopods by the actions of many writers in erecting new genera based upon obviously juvenile specimens and in disregarding, when convenient, the Rules of Zoological Nomenclature. Such difficulties are most marked in the Cranchiidae but similar problems crop up in many other families. If in fact *Parateuthis* is a juvenile *Alluroteuthis*, then since *Parateuthis* dates from 1921 it must take precedence over *Alluroteuthis* of 1923 and the family name, if retained, will also have to be changed. It is very often difficult to prove that a particular juvenile indubitably gives rise to a particular adult, and of course such decisions are often anything but objective. The result can very easily be an unstable nomenclature even at the family level. In the present situation it seems best to retain *Alluroteuthis* of Odhner, 1923, until some certainty can be reached in the matter, rather than change the nomenclature on uncertain grounds.

Family CRANCHIIDAE.

Genus TAONIDIUM Pfeffer, 1900.

Type: *Taonidium suhmi* Hoyle, 1885 nec Lankester, 1884.

The writer (Dell, 1952, p. 139) has already commented upon the usage of the genera *Procalistes* Lankester 1884 (Type species, *Procalistes suhmi* Lankester) and *Taonidium* Pfeffer, 1900 (Type species, *Taonius suhmi* of Hoyle), and has pointed out that two genera have been accepted as valid although they are based upon the same type species. Chun (1910, p. 382) has considered that *Taonidium suhmi* of Hoyle is a juvenile stage of *Galiteuthis armata* Joubin, and Muus (1956, p. 12) considers that this is very probable.

Under the present Rules of Nomenclature, however, it would appear (Hemming 1953, pp. 68-69) that in fact the names *Procalistes* and *Taonidium* may be validly used with the type species quoted as *Procalistes suhmi* Lankester and *Taonius suhmi* Hoyle respectively. This recommendation of the Copenhagen conference is one with which the writer is not happy as it will obviously cause difficulty in interpretation. At the same time one must abide by the Rules in their entirety. Until the progression from *Procalistes* through *Taonidium* to *Galiteuthis* can be proved it seems best to retain these generic names for the individual stages.

TAONIDIUM SUHMI (Hoyle, 1885).

Taonius suhmi Hoyle, 1885, p. 472; 1886, p. 192, pl. 32, figs. 5, 10.

Taonidium suhmi Pfeffer, 1900, p. 192.

BANZARE LOCALITY: Station 69 (N 100 H).

A single rather poorly preserved specimen seems to agree fairly closely with Hoyle's account of *Taonius suhmi* and with the juveniles treated by Chun as juveniles of *Galiteuthis armata* Joubin. Under the Rules of Zoological Nomenclature as interpreted by the Copenhagen Decisions (Hemming, 1953, pp. 68-69), Pfeffer's action in designating *Taonius suhmi* Hoyle, as distinct from *Procalistes suhmi* Lankester, as type species of *Taonidium* is tantamount to the erection of "a new binomen composed of the cited generic name and of a specific name consisting of the same word as that borne by the species under which the type species was erroneously cited by the author of the new generic name". The type species of *Taonidium* therefore becomes *Taonidium suhmi* Hoyle in spite of the fact that there is a prior *Procalistes suhmi* Lankester and and that both forms were considered identical by Hoyle, under the name *Taonius suhmi* (Lankester).

The BANZARE specimen has the colour note, "Quite transparent, except for red-brown spots at tips of long arms, etc." There is no sign of developing hooks on the suckers of the tentacle club so that the specimen supplies no further evidence of the progression from *Taonidium* to *Galiteuthis*.

Genus CRYSTALLOTEUTHIS Chun, 1906.

Type: *Crystalloteuthis glacialis* Chun, 1906.

CRYSTALLOTEUTHIS GLACIALIS Chun, 1906.

Crystalloteuthis glacialis Chun, 1906, p. 85; 1910, p. 372.

TYPE LOCALITY: "Valdivia" Station 145, 59° 16' S., 40° 13' E., in 1500 metres.

BANZARE LOCALITIES: Stations 27 (N 200 H), 91 (N 70 V), 93 (N 200 H), 96 (N 200 H), 111 (N 200 H).

This species does not seem to have been recorded since Chun's original description. The BANZARE collections would indicate that it is a typical species of the Antarctic fauna between 40° and 143° E., in depths from 750 to 1710 metres.

Genus TEUTHOWENIA Chun, 1910.

Type: *Teuthowenia antarctica* Chun, 1910.

TEUTHOWENIA ANTARCTICA Chun, 1910.

Teuthowenia antarctica Chun, 1910, p. 376, pl. 56, figs. 1-5; pl. 57, figs. 3-7; Pfeffer, 1912, p. 745; Massy, 1916, p. 170, figs. 41-43.

TYPE LOCALITY: "Valdivia" Station 136, 55° 57' S., 16° 14' E., vertical net to 2000 metres.

BANZARE LOCALITIES: Station 93 (N 200 H), 4 specimens, mantle lengths 9.5, 8.0, 7.5 and 7.0 mm. respectively; Station 96 (N 100 B), one specimen, mantle length 8 mm. (N 200 H), one specimen, mantle length 9.5 mm.

The BANZARE specimens agree very well with Chun's figures and description of *Teuthowenia antarctica*, except that they have four rows of suckers on the tentacle stalks. All these specimens, and the ones mentioned by Massy, are obviously larval Cranchiids. Muus (1956) has shown that a number of small Cranchiids almost certainly represent growth stages in what has been known as *Desmoteuthis* (or *Taonius*) *hyperboreus* Steenstrup. In particular he has been able to demonstrate that *Teuthowenia megalops* (Prosch) is a larval stage of this species, the correct name for which appears to be *Desmoteuthis megalops* (Prosch). Muus also argues that *Teuthowenia antarctica* Chun should be included in the synonymy of this species as a stage in development, more particularly as Massy's specimens had four rows of suckers on the tentacle stalks and this was the major distinction between *Teuthowenia antarctica* Chun and *Teuthowenia megalops* (Prosch). The BANZARE specimens also show that this distinction is not valid. On the other hand the form known as *Teuthowenia antarctica* appears to have a characteristic southern distribution and as yet no adult forms of *Desmoteuthis* seem to have been collected in this area. It is therefore possible that the adults of *Teuthowenia antarctica* are not in fact *Desmoteuthis megalops*. While it is certain that the systematics of the Cranchiidae have been clouded by the tendency of many authors to describe new genera and species based upon single collections of obviously larval forms, or sometimes a single larva, the situation will not be rectified by too sweeping amalgamation of forms. Muus has put forward very cogent reasons for considering *Teuthowenia megalops* (Prosch), *Megalocranchia pellucida* Pfeffer and *Helicocranchia pfefferi* Massy as juveniles of *T. hyperboreus* Steenstrup and presents a reasonable case for including *T. antarctica* Chun as well. But his treatment of this latter form is by no means full. For these reasons the writer has retained *T. antarctica* as a reasonable label for what still appears a distinctive southern form.

Family HISTIOTEUTHIDAE.

For a family with such a striking morphological peculiarity as a markedly asymmetrical head the Histioteuthidae has received very little sustained attention. Generic divisions have been established and maintained on arbitrary and probably quite superficial features and the usual subfamily subdivision can hardly be said to be firmly based. As some of the type species of the genera are being re-examined it is becoming obvious that the characters classically given as diagnosing individual genera are not in accord with the actual characters of the type species of those genera. Voss (1956, pp. 140-142) has re-examined the much maligned *Calliteuthis reversa* Verrill and has shown what complexities of nomenclature have resulted from this tendency to use "book" genera without referring back to the type species.

In an effort to clarify the position the major characters of each described genus, based upon the characters of the type species, in so far as these can be determined, have been detailed below.

Genus *Histioteuthis* d'Orbigny, 1839.Type species (monotypy) *Cranchia bonellii* Ferussac.

The type specimen does not seem to have been re-described and is probably no longer in existence. There does not, however, appear to be any difficulty in establishing the identity of this species and descriptions have been given by Chun (1910), Pfeffer (1912) and Robson (1924).

The major features are the enormously developed interbranchial web with its peculiar arrangement whereby the first three pairs of arms are joined to their fellows by a web extending from adjacent arm to adjacent arm while the third pairs are joined not to the fourth pair but to one another. The fourth pair are also joined to one another by a web, the median angle of which is joined to the median angle of the web joining the third pair of arms. This arrangement results in a buccal membrane with only 6 points in the adult (7 in the juvenile). Chun (1910, text figure 1, figs. 3 and 4) has published a photograph of the two dorsal hectocotyliised arms of *Histioteuthis ruppellii* Verrill (= *bonellii*). The rings from the suckers on the sessile arms bear sharp teeth on the distal margins. The suckers on the tentacle clubs are arranged in two series, the rings serrated. A single row of light organs on the outer surface of the first and second pairs of arms, two rows on the third pair and three rows on the ventral arms.

Genus *Histiopsis* Hoyle, 1885.Type species (monotypy) *Histiopsis atlantica* Hoyle.

Hoyle commented upon this genus that it "is evidently related both to *Histioteuthis* and to *Calliteuthis*, and in many respects is intermediate between them. For instance, while *Histioteuthis* has a large web, and *Calliteuthis* none, *Histiopsis* has a web which reaches half way up the arms. The dorsal bands of the siphon are present in *Histioteuthis*, present in *Calliteuthis*, whilst in *Histiopsis* they are present but concealed, and not obvious except on close examination."

Pfeffer (1900, p. 170) classed *Histiopsis* as a synonym of *Histioteuthis* and *H. atlantica* Hoyle as a juvenile of *Histioteuthis bonellii* Ferussac.

Genus *Histiiothauma* Robson, 1948.Type species (o.d.) *Histiiothauma oceanii* Robson.

The following characters, adapted from Robson's original account seem to sum up this genus. No trace of web. Fins very small. No suckers left on sessile arms although this may be due to accident. Peduncles of suckers enlarged to form pyramidal structures. Arm-membranes of both kinds absent. Tentacular suckers small and undifferentiated, no carpal system. Density of light organs moderate (given as midway between *Histioteuthis* and *Meleagroteuthis*). Two irregular rows of light organs on the first, second and third pairs of arms, five rows on the ventral arms.

The status of this genus is most unsatisfactory since it is based upon a single immature specimen. One of the crucial characters may be due to damage or it may be a normal development and there is no way of checking until more specimens are collected.

Genus *Meleagroteuthis* Pfeffer, 1900.Type species (monotypy) *Meleagroteuthis hoylei* Pfeffer.The main characters of *M. hoylei* appear to be:—

Web weakly developed. Rings on suckers of sessile arms set with teeth all round the margin. Rings on suckers of tentacle clubs without denticulation (?). Buccal membrane with seven points. Light organs on ventral arms in 8 rows at the base, on the third pair of arms in four rows and on the second and first pairs in three rows respectively. A row of cartilaginous tubercles along the mid dorsal line of the mantle and down the outer edges of the first, second and third pairs of arms.

Genus *Calliteuthis* Verrill, 1880.Type species (o.d.) *Calliteuthis reversa* Verrill.

The name *Calliteuthis reversa* Verrill was used at first rather indiscriminately for any species showing any affinity to Verrill's original description and more lately in such a false and narrow sense that it would have excluded the type specimen. Voss (1956, pp. 139-142) has recently given a new description based in part on the type specimen and in part on new material, and has detailed some of its nomenclatural history.

The major features of *Calliteuthis reversa* and hence features which must be included in the concept of the genus *Calliteuthis* are as follows:—

A low interbrachial membrane between the dorsal arms. Rings of suckers from sessile arms "not toothed on their margins except occasionally distally where there are a few low, blunt teeth on the distal margin. Buccal membrane with seven connectives". Suckers from hand of tentacle club with rings which are armed with prominent, crowded triangular teeth. Light organs in three rows on bases of ventral arms. Remaining arms with two rows of light organs.

The accessory chitin structures on the rings of the tentacular suckers and the completely smooth rings on the suckers of the sessile arms, two features that have often been quoted as characteristic of this genus, no longer have any relevance.

Genus *Stigmatoteuthis* Pfeffer, 1900.Type species (monotypy) *Histiopsis hoylei* Goodrich.

Regardless of the characters used to define this genus by Pfeffer, any interpretation of the genus must primarily be based upon the characters of the type species, *Histiopsis hoylei* Goodrich. In turn the characters of this species must be based primarily upon Goodrich's original description and the type specimen.

On this basis the characters of the genus would be:—

The web is rudimentary. Rings from the suckers on the sessile arms set with small, sharp teeth. Suckers on the tentacle club arranged in two distinct series, the rings from the suckers with pointed teeth. Buccal membrane seven-lobed. Light organs on the ventral arms arranged in three rows, on the third pair of arms in a single row.

It will be appreciated that the characters given above under each genus are the primary characters of each type species. If additional species are to be included in any genus then the diagnostic characters for the genus may require to be widened suitably to accommodate them. If, however, any of these genera cannot be kept as separate entities on the basis of their type species (and these type species must be evaluated primarily by their type specimens) then those genera should not be retained as separate on any basis. There is little point in considering *Histiothauma* which is based upon some unusual features found in a single, damaged immature specimen nor *Histiopsis* which has generally been considered to be based upon a juvenile *Histioteuthis bonellii*. The other genera have been differentiated largely on the basis of the degree of development of characters which are present throughout the group rather than by the presence or absence of discrete characters.

The degree of development of teeth on the rings of suckers from sessile arms and tentacle clubs and the type of teeth produced varies between these genera, but the differences can hardly be more than specific and may even be individual. The arrangement of the suckers on the tentacle club has been used as a diagnostic character, the distinction being drawn between a club with the suckers falling into two series (a carpal series distinguished by larger size) and one with the suckers relatively undifferentiated. This distinction is also often one of degree.

The relative development of the interbrachial web varies from none at all in *Histiothauma* to a very well developed web in *Histioteuthis*. When type species of genera alone are compared there is a well-marked distinction between *Histioteuthis* and the rest of the genera in this respect. The New Zealand form, "*Histioteuthis*" *cookiana* Dell, where the web ranges from 18 to 115 per cent of the mantle, does materially bridge this gap.

The buccal membrane has seven points in all genera (unknown in *Histiothauma*) except in adult *Histioteuthis* where there are only six (seven in juveniles apparently).

The density of photophores has often been used as a distinguishing feature. This is often a subjective measure but the number of rows of photophores on the outer surface of the individual sessile arms, measured at the base, does supply a more objective standard. In order to evaluate these differences this information has been tabulated for the known species of the family.

					1st Pair	2nd Pair	3rd Pair	4th Pair
<i>Histioteuthis bonellii</i> Ferussac	..	..	..	..	1	1	2	3
<i>Calliteuthis reversa</i> Verrill	..	..	..	..	2	2	2	3
<i>C. miranda</i> Berry	..	..	..	..	2	2	2	5
<i>C. cookiana</i> Dell	..	..	..	..	0	2	2	4
<i>C. ocellata</i> Owen	..	..	..	..	—	—	—	3
<i>Stigmatoteuthis hoylei</i> Goodrich	..	..	..	..	0	0	1	3
<i>S. arcturi</i> Robson	..	..	..	..	?	?	?	?
<i>S. dofleini</i> Pfeffer	..	..	..	..	1	1	1	3
<i>S. japonica</i> Pfeffer	..	..	..	..	?	?	?	?
<i>Meleagroteuthis hoylei</i> Pfeffer	..	..	..	..	3	3	4	8
<i>M. separata</i> Sasaki	..	..	..	..	0	3	3	9
<i>M. asteroessa</i> Chun	..	..	..	..	1	2	3	8
<i>Histiothauma oceani</i> Robson	..	..	..	..	2	2	2	5

The only distinction which could validly be drawn on this basis would be between those with 3 to 5 rows of light organs on the ventral arms and those with 8 to 9 rows. There is certainly little difference between *Calliteuthis* and *Stigmatoteuthis* in this respect. All the other differences could only be considered specific in value.

Another feature that has been used to differentiate forms within this family is the presence of rows of cartilaginous tubercles along the backs of the first three pairs of arms and along the mid-dorsal line of the mantle. Such tubercles have been recorded in *Meleagroteuthis meleagroteuthis* Chun (= *hoylei* Pfeffer), *M. separata* Sasaki, *Calliteuthis miranda* Berry and *Histioteutha oceani* Robson (not present on mantle). The significance of these tubercles is not known and there is a possibility that they may be present at one stage of development and not at others.

Some attempt must now be made to evaluate these genera. Firstly there seems little reason for continuing to divide the family into the two subfamilies of *Histioteuthinae* and *Calliteuthinae*. Such differences as have been shown to be valid are no more than generic in value. Of the possible generic characters discussed above, the degree of differentiation of the suckers on the tentacle club does not produce any clear-cut divisions. The detailed arrangement of suckers supplies a useful character at the specific level. In most species a carpal series of suckers seems to be differentiated, at least in adults. One genus, *Histioteuthis*, can be separated off as having only six lappets on the buccal membrane (and even this species apparently has the more usual seven in juveniles). The same genus has a well developed web while in most of the other species this feature is only slightly developed. In one species which does not agree otherwise with *Histioteuthis*, the web is strongly developed in some specimens. As has been demonstrated two groups may be differentiated, one with 3 to 5 rows on the ventral arms, the other with 8 to 9 rows.

Using these distinctions the following genera may be defined:—

Histioteutha must still be accepted since its chief features cannot be evaluated. *Histioteuthis* distinguished by 6 lappets on the buccal membrane in the adult, an enormously and peculiarly developed interbrachial web, and three rows of photophores on the ventral arms.

Calliteuthis (= *Stigmatoteuthis*) with 7 lappets on the buccal membrane in the adult, an interbrachial web which may be weakly or very well developed, though usually not very strong and three to five rows of photophores on the ventral arms.

Meleagroteuthis with 7 lappets on the buccal membrane, a weak web and 8 to 9 rows of photophores on the ventral arms.

The differences between *Calliteuthis* and *Meleagroteuthis* are differences of degree only but the density of photophores does divide them satisfactorily. It will not require the discovery of many intermediates to make the subdivision thoroughly artificial. When more is known of the internal anatomy of more species, of specific variation, and of the details of hectocotylisation better grounds for division may be demonstrable. In the meantime the known species may be grouped as follows:—

The only species in *Histioteutha* is the type species, *H. oceani* Robson. Similarly *Histioteuthis* will include only *H. bonellii* though study of large geographical and growth series may demonstrate that more than one form is represented. *Calliteuthis* may include *reversa* Verrill, *miranda* Berry, *cookiana* (Dell), *ocellata* (Owen), *hoylei* (Goodrich), *dofleini* Pfeffer, *japonica* Pfeffer and *arcturi* Robson. These may not all stand up to critical appraisal. It seems almost certain that either *dofleini* or *japonica* will prove to be synonymous with *ocellata*, if all three names are not based upon the same species. All three species have been described from the same general area. In *Meleagroteuthis*, the three species *hoylei* Pfeffer (= *meleagroteuthis* Chun), *separata* Sasaki and *asteroessa* Chun, may be included. Any author describing a new species within this family should be prepared to compare it with all previously described species.

The above summary may be an over-simplification but it seems a more realistic basis for further work than Pfeffer's (1912) rather complicated revision.

CALLITEUTHIS MIRANDA Berry, 1918.

Calliteuthis miranda Berry, 1918, p. 221; Allan, 1945, p. 334.

Histioteuthis miranda Dell, 1951, p. 5; 1952, p. 134.

TYPE LOCALITY: South-east of Gabo Island, Victoria, Australia, in 270 fathoms.

BANZARE LOCALITY: Station 71 (N 100 H).

The colour note enclosed with the label reads:—

"General colour rich port wine brown with metallic lustre. In each pore bright spots of gold and cerise. Spots of luminous violet near tips of arms."

There are three well preserved specimens from Station 71, the largest 39 mm. in mantle length. They agree very well with Berry's description of *C. miranda* except that they lack any trace of the "cartilaginous, tubercle-like spines" along the mid-dorsal line of the mantle and dorsal arms. The writer has in the past (Dell, 1951, p. 5; 1952, p. 134) argued that *C. miranda* Berry and the closely related *C. cookiana* Dell should be placed in *Histioteuthis* rather than *Calliteuthis*. A better understanding of the characters of *Calliteuthis reversa* and a re-appraisal of the generic limits within the family now convince me that these two species are best classified in *Calliteuthis*.

HISTIOTEUTHIS BONELLII Ferussac, 1835.

Cranchia bonellii Ferussac, 1835, ann. 5, cl. 5, pl. 56.

Histioteuthis bonelliana d'Orbigny, 1839, p. 327; Hoyle, 1886, p. 43; Chun, 1910, p. 148; Pfeffer, 1912, p. 297; Robson, 1924, p. 608.

Histioteuthis collinsi Verrill, 1879, p. 241; 1882, pp. 234, 300; Hoyle, 1886, p. 44.

Histioteuthis ruppellii Verany, 1851, p. 117; Hoyle, 1886, p. 44.

Histiopsis atlantica Hoyle, 1885, p. 201; 1886, p. 42.

TYPE LOCALITY: French Mediterranean coast.

BANZARE LOCALITY: Station 73 (N 200 H).

This species occurs in the North and South Atlantic, and the Mediterranean and there has been one previous record from the Indian Ocean, south of Madagascar (Thiele, 1921, p. 452). There are two small specimens from Station 73, the larger 63 mm. in total length.

CEPHALOPODS AS FOOD OF VERTEBRATES.

As is usual in biological collections from the Antarctic, a large series of Cephalopod remains, obtained from the stomachs of various mammals, birds and fishes, was brought back by the BANZARE Expedition. Most of this material came from bird stomachs and for the most part consists of mandibles although broken pens and spermatophores are also represented. The contribution that such remains can make to a knowledge of the composition and distribution of the Antarctic cephalopod fauna is slight. They do show that cephalopods, especially squids, are much commoner in Antarctic waters than any biological collections to date would indicate, and also that some of the squids grow considerably larger, or that larger forms occur there than have been collected.

The major importance of collections such as this is the evidence they supply for the enormously important place that the cephalopods fill in the food chains of Antarctic vertebrates. Field notes upon the stomach contents of Antarctic birds often mention the presence of cephalopod remains but the present collection seems one of the largest ever documented. It has therefore seemed worth while listing the cephalopod remains in general terms under the vertebrate concerned. The nomenclature used for the vertebrates has been brought up to date as far as possible. In order to allow easy cross reference to the published account of the birds, in the few cases where this name differs from that used by Falla (1937), this latter name is given in parentheses. When measurements are given of mandibles, the maximum diameter quoted is measured in the way illustrated by Robson (1929, p. 28, fig. 5a, "total length").

MAMMALS.

Mirounga leonina (sea elephant). Coll. 57, Possession Is. Crozets 3-11-29. c. 70 mandibles.

Lobodon carcinophaga (crabeater seal). Coll. 1203, Pack Ice, 64° 28' S., 114° 59' E., 21-1-31, six mandibles maximum diameter 34 mm.; two pens, the largest 300 mm.; and two eye lenses.

BIRDS.

Aptenodytes forsteri Gray (emperor penguin). Coll. 526, Pack Ice, 66° 23' S., 73° 16' E., 21-12-29. Macerated tips of c. 400 small mandibles all of approximately the same size.

Coll. 531 from same material as coll. 526. Damaged and tangled remains of spermatophores.

Aptenodytes patagonica Miller (king penguin). Coll. 505, Heard Is., 1-12-29. Macerated remains of c. 30 mandibles, maximum diameter c. 15 mm.

Coll. 823, Royal Sound, Kerguelen, 11-2-30. Remnants of c. 57 macerated mandibles, maximum diameter c. 15 mm.

Coll. 1142, Lusitania Bay, Macquarie Is., 5-12-30. c. 120 rather macerated mandibles, maximum length 12 mm., but some fragments of larger beaks.

Eudyptes schlegeli Finsch (royal penguin) } Coll. 1164, Macquarie Is., 2-12-30. Eight broken
Eudyptes cristatus cristatus Miller (rockhopper penguin) } mandibles, maximum diameter, 5 mm.

Diomedea exulans chionoptera (Salvin) (snowy albatross). Coll. 13, 42° 11' S., 54° 10' E., 29-10-29. Eight mandibles, maximum length 35 mm.

Coll. 70, Crozets, 2-11-29. Vomited by nestling. Numerous spermatophores and many mandibles, maximum diameter 44 mm.

Coll. 130, Crozets, 3-11-29. Many spermatophores, nine mandibles, maximum diameter 40 mm.

Thalassarche melanophrys (Temminck) (black-browed albatross). Coll. 1119, Station 78, 44° 05' S., 147° 35' E., 26-11-30; Two mandibles, maximum length 34 mm.

Coll. 1181, Station 86, 62° 27' 30" S., 164° 29' E., 21-12-30. Two mandibles, maximum length 10 mm.

Phoebastria palpebrata (Forster) (light-mantled sooty albatross). Coll. 683, Station 44, 64° 55' S., 55° 35' E., 27-1-30. Fragments of a large pen, ten mandibles, longest diameter 30 mm.

Coll. 1027, Murray Island, Kerguelen, 23-2-30. Nineteen mandibles, maximum length 29 mm.

- Macronectes giganteus* (Gmelin) (giant petrel). Coll. 1019, Observatory Bay, Kerguelen, 23-2-30. Four mandibles, maximum diameter 24 mm.
- Daption capense* (Linnaeus) (Cape pigeon). Coll. 533. Pack Ice, 66° 23' S., 73° 16' E., 21-12-29. c. 12 broken spermatophores, one lens.
Coll. 538. Pack Ice, 66° 23' S., 73° 16' E., 21-12-29. Remains of two mandibles.
Coll. 632. Station 36. Proclamation Island, 13-1-30. Remains of two small mandibles.
- Fulmarus glacialis* (Smith) (= *Priocella glacialis*) (silver grey petrel). Coll. 536. Pack Ice, 66° 23' S., 73° 16' E., 21-12-29. Macerated remains of 8 mandibles.
Coll. 1171. Station 85, 65° 41' S., 178° 29' 30" E., 15-12-30. Remains of at least 15 mandibles.
- Thalassoica antarctica* (Gmelin) (Antarctic petrel). Coll. 498. 65° 13' S., 80° 53' E., 14-12-29. Remains of three mandibles.
Coll. 547. Pack Ice, 66° 23' S., 73° 16' E., 21-12-29. Eighteen spermatophores.
Coll. 575. Station 31, Pack Ice, 66° 11' S., 65° 10' E., 31-12-29. Macerated remains of three mandibles.
Coll. 631. Station 36, Proclamation Island, 65° 51' S., 53° 40' E., 13-1-30. Remains of one mandible.
Coll. 672. Station 44, 64° 55' S., 54° 35' E., 27-1-30. Remains of one mandible.
Coll. 1175. Station 85, 65° 41' S., 178° 29' 30" E., 16-12-30. Two broken mandibles.
- Pagodroma nivea* (Forster) (snow petrel). Coll. 527. Pack Ice, 66° 23' S., 73° 16' E., 21-12-29. One mandible, maximum length 5 mm.
Coll. 541. Pack Ice, 66° 23' S., 73° 16' E., 21-12-29. Two spermatophores.
Coll. 604. Station 36, 65° 51' S., 53° 40' E., 13-1-30.
Coll. 675. Station 44, 64° 55' S., 54° 35' E., 27-1-30. Two broken mandibles.
- Pachyptila desolata* (Gmelin) (Antarctic prion). Coll. 401. Kerguelen, 20-12-29. Two small damaged mandibles.
Coll. 1013. Royal Sound, Kerguelen, 23-2-30. Two small damaged mandibles.
- Pachyptila belcheri* (Mathews) (narrow-billed prion). Coll. 1009. Royal Sound, Kerguelen, 27-1-30. (Juv.) Two small damaged mandibles.
- Procellaria aequinoctialis* Linnaeus (white-chinned petrel or cape hen). Coll. 698. 55° 11' S., 55° 55' E., 3-2-30. "Cephalopod beaks from gizzard—and pens from stomach Cape Hen, *Majaquens aequinoctialis*." Fragment of solid type of pen (stomach), 18 mandibles (gizzard), maximum length 17 mm.
Coll. No. 816. Royal Sound, Kerguelen, 10-2-30. Pieces of pen up to 90 mm. in length, broken remains of 8 mandibles.
Coll. 1011. Royal Sound, Kerguelen, 27-2-30. Many greatly damaged remnants of mandibles.
- Procellaria cinerea* Gmelin (grey petrel). Coll. 973, Station 61, 27-2-30. Greatly broken remains of mandibles.
Coll. 1014, Royal Sound, Kerguelen, 27-2-30. Damaged remnants of 10 to 20 mandibles.
- Pterodroma macroptera macroptera* (Smith) (grey-faced petrel). Coll. 291, Kerguelen, 21-11-29. From birds Nos. 290 and 312, both very young. Many remnants of small mandibles.
Coll. 367, Kerguelen (Juv.). Highly comminuted fragment of c. 20 small mandibles.
Coll. 1003. Royal Sound, Kerguelen, 27-2-30. Few broken fragments of mandibles.
- Pterodroma lessoni* (Garnot) (white-headed petrel). Coll. 848. Royal Sound, Kerguelen, 22-2-30. From bird No. 849. Two mandibles maximum length 10 mm., 6 lenses.
Coll. 1731, off South Australian coast. Many fragments of mandibles.

PISCES:

Scyliorhinus analis (Ogilby). Coll. 1332. Station 113. From fish, 330. Two mandibles maximum length 8 mm.

DISCUSSION.

In discussing the distribution of Antarctic cephalopods it is necessary to define some faunal boundaries. With a group like the cephalopods with benthic, surface water and bathypelagic representatives it is even difficult to define the area to be included in the Antarctic zone. If the mean position of the Antarctic Convergence is taken as the northern boundary, such a zone may have little necessary relevance for benthic or bathypelagic forms, however critical the boundary may be for species living in the surface waters. For the purpose of listing the Antarctic cephalopod fauna, the mean position of the Antarctic Convergence as estimated by Mackintosh (1946, Plate 1) has been taken as the northern boundary. This is still an arbitrary boundary as the true boundary for forms living in the surface waters is the boundary at the time of collection and not the mean position of an irregularly fluctuating convergence. But with the present scattered and exceptionally meagre collections from the boundary areas any discussion of this problem would be purely academic. The Antarctic Zone as defined for the present discussion includes the shores of the Antarctic Continent, the marine faunas of the South Shetlands, South Orkneys, South Georgia and the South Sandwich Islands, Bouvet, Kerguelen and Heard but not Tierra del Fuego, the Falklands, Prince Edward Island, Crozet Island nor Macquarie Island. To a certain extent this is obviously not a natural division especially as regards the benthic forms associated with island shelves. The little we know of the cephalopods of Kerguelen for example indicates that the faunal affinities are with the Subantarctic rather than the Antarctic.

In order therefore to discuss the relationships of such forms, and also of the Antarctic cephalopods proper, the faunal provinces as re-defined by Powell (1951, p. 66) have been utilised. These are:—

1. *Magellan*: Patagonia from south of Chiloe Island (west coast) and Cape Blanco (east coast), Tierra del Fuego and the East Patagonian shelf including the Falkland Islands and the Burdwood Bank.
2. *Georgian*: South Georgia and Shag Rock.
3. *Kerguelenian*: Kerguelen Island, Heard Island, the Crozets, Marion and Prince Edward Islands. Possibly Bouvet and Macquarie.
4. *Antipodean*: The Subantarctic islands of New Zealand, Campbell, Auckland, Bounty and Antipodes Islands.

CEPHALOPOD FAUNA OF THE MAGELLAN PROVINCE.

The cephalopods of the Magellan area have not been properly monographed. The following list has been compiled from the literature and will undoubtedly be considerably revised when the fauna is critically studied by South American workers. The following symbols are used to indicate the three major areas:

- P. Patagonia and Tierra del Fuego.
- F. Falkland Islands.
- B. Burdwood Bank.
- T. Indicates type locality.

Rossia (Semirossia) tenera (Verrill). P.

Loligo gahi d'Orbigny. P.

Loligo patagonicus Smith. P.

Loligo (?) ellipsura Hoyle. P.

Pterygioteuthis giardi Fischer. P.

Onychoteuthis banksi (Leach). P.

Moroteuthis ingens (Smith). P.

Ommastrephes bartrami (Lesueur). P.

Pareledone turqueti (Joubin). Rio de Janeiro.

Pareledone charcoti (Joubin). Rio de Janeiro.

Octopus (Octopus) pentherinus Rochebrune & Mabile. P.

Octopus (Octopus) tehuelchus d'Orbigny. P. F. (?).

Enteroctopus megalocyathus (Gould). (= *patagonicus* Lonnberg = *brucei* Hoyle). P. B. F.

E. membranaceus Rochebrune & Mabile. P.

Robsonella fontaniana (d'Orbigny). P.

Benthoctopus eureka Robson. F.

B. magellanicus Robson. P. F. (T.)

B. rotunda Hoyle.

The fact that *Pareledone charcoti* and *P. turqueti* which have been recorded from Rio de Janeiro and from South Georgia have not yet been recorded from the Magellan region proper indicates that the fauna is very incompletely known.

GEORGIAN PROVINCE.

Rossia (Semirossia) tenera (Verrill).

Pareledone charcoti (Joubin).

P. turqueti (Joubin).

P. polymorpha (Robson) (T.).

Thaumeledone gunteri Robson (T.).

KERGUELENIAN PROVINCE.

Benthoctopus thielei Robson (Kerguelen, T.).

B. levis (Hoyle). (Heard, T.)

Benthoteuthis megalops Verrill (north of Prince Edward Island, Thiele).

ANTIPODEAN PROVINCE.

Notodarus sloanii sloanii (Gray). Auckland Islands.

Octopus maorum (Hutton). Camp. Auck.

Pinnoctopus cordiformis (Q. & G.) (? Camp.)

Robsonella australis (Hoyle). Camp. Antip.

R. huttoni Benham. Auck.

ANTARCTIC PROVINCE.

The shores of the Antarctic Continent have not as yet been satisfactorily divided into biological regions and insufficient evidence exists for determining boundaries. Soot-Ryen (1951, p. 38) in discussing the distribution of Antarctic pelecypods, arbitrarily outlined the areas from which pelecypods had been collected and designated each with a number. The major disadvantage of continuing such a scheme is that

as additional areas are investigated additional numbers must be added rather haphazardly as regards geographical position and the boundaries between contiguous areas become rather tenuous. Probably the simplest way at present is to divide the Antarctic shorelines by arcs of longitude, arranging these so that no obvious geographical features such as the Weddell and Ross Seas, are cut by these arbitrary boundaries. For purposes of mapping limits of distribution therefore, the shores of the Antarctic Continent have been subdivided on the following basis:—

1. 30° E. to 60° W.
2. 60° W. to 120° W. (including the eastern coasts of the Palmer Peninsula).
3. 120° W. to 170° E.
4. 170° E. to 80° E.
5. 80° E. to 30° E.

There are large sectors from which no biological collections have been made so that gaps in distribution may be more apparent than real. The following list details all the species which have been recorded south of the Antarctic Convergence. The numbers following each indicate in which of the five sectors enumerated above they occur. The symbols P and B have been used to show if a species is Pelagic or Benthic in habitat:—

- Pareledone charcoti* (Joubin) B. 1, 2, 3, 4, 5.
Pareledone turqueti (Joubin) B. 1, 2, 3.
Pareledone adeliana (Berry) B. 4, 5.
Pareledone polymorpha (Robson) B. 1.
Pareledone harrissoni (Berry) B. 4, 5.
Pareledone antarctica (Thiele) B. 4.
 (?) *Graneledone setebos* Robson B. 3.
Bentheledone albida (Berry) B. 4.
Bentheledone rotunda (Hoyle) B. 4.
Thaumeledone gunteri Robson B. 1.
Grimpoteuthis mawsoni (Berry) B. (?) 4.
Cirroteuthis glacialis Robson. B. (?) 2.
Moroteuthis ingens (Smith). P. 1.
Alluroteuthis antarcticus Odhner. P. 1, 4, 5.
Bathyteuthis abyssiicola Hoyle. P. 1.
Psychroteuthis glacialis Thiele. P. (Locality not given.)
Taonidium suhmi Hoyle. P. 1.
Taonius pavo Lesueur. P. 5.
Teuthowenia antarctica Chun. P. 1, 4.
Crystalloteuthis glacialis Chun. P. 4, 5.

It is obvious to anyone who has worked on Antarctic cephalopods that our knowledge of the fauna is still at an elementary stage. It is unfortunate that the results of the "Discovery" collections, especially the squids and octopods collected after Robson's account (1930), have not yet been published as these would undoubtedly add greatly to our knowledge of the Cephalopoda of the Antarctic and adjacent seas.

Amongst the Octopoda the dominant forms are the Eledonids which in the Antarctic proper have entirely replaced members of the genus *Octopus*. *Octopus*-like forms with biserial suckers are found at Kerguelen, at Campbell Island and Tierra del Fuego. To the south the Octopods are represented by the uniserial Eledonids and two species of Cirroteuthids. Robson (1932, pp. 51, 256) has discussed the inter-relationships of the Eledonid forms with uniserial suckers and large eggs and has concluded that they are probably diphyletic. He finally classified *Eledone* and *Pareledone* in the subfamily Octopodinae and *Graneledone*, *Thaumeledone* and *Bentheledone* together with *Bathypolypus* in the subfamily Bathypolypodinae. There is little additional evidence that can be added to Robson's account and his provisional classification still seems the best solution to the systematic problem. It should be realised that the systematics are provisional and little value can be gained by discussing relationships or possible origins for the Antarctic forms. If a migration route is necessary to derive the Antarctic forms from northern *Eledone* stock, the shores of the South American continent provide as useful a route for these benthic cephalopods as they do for many other molluscs (Powell, 1951, pp. 65-72).

Of the eight Decapod cephalopods, three species, *Alluroteuthis antarcticus* Odhner, *Crystalloteuthis glacialis* Chun and *Psychroteuthis glacialis* Thiele are endemic to the Antarctic zone or to closely adjacent seas. Both the genera *Alluroteuthis* and *Psychroteuthis* are monotypic and apparently endemic to the Antarctic. This endemism may only be apparent as the position of *Alluroteuthis* has not been revised since Odhner erected it and *Psychroteuthis* was erected on a number of fragmentary specimens. The other species all belong to wide-ranging pelagic genera. Of the eight species four belong to the family Cranchiidae.

As regards the distribution of cephalopods around the Antarctic continent proper, allowing for areas where no cephalopods have as yet been collected, a few generalisations may be made. One species, *Pareledone charcoti*, can apparently be recorded as a circum-antarctic form; it seems almost certain that *Alluroteuthis antarcticus* will prove to belong to the same category, and *Pareledone turqueti* or a closely allied group of species is widely distributed.

There are obviously enormous gaps in our knowledge of Antarctic and Subantarctic cephalopods. No littoral nor sublittoral forms have as yet been recorded from Bouvet, Heard, Prince Edward Island, the Crozets nor Macquarie Island. There is considerable uncertainty about the littoral forms from Kerguelen. Improved knowledge of benthic forms from these islands would supply material of use in elucidating the systematics of the Antarctic forms. The one group of Subantarctic Islands for which adequate data is available are those of the New Zealand area where the cephalopods are obviously derived from New Zealand itself. The genus *Robsonella*, however, which occurs throughout the New Zealand area, extends as far south as Campbell Island. The same species occurs in southern Australia and a closely related form lives in southern South America.

REFERENCES.

- Allan, J., 1945. Planktonic Cephalopod Larvae from the Eastern Australian coast. *Rec. Austr. Mus.*, 21, 317-350.
- Adams, W., 1938. *Robsonella* nom. nov. fur *Joubinia* Robson 1929. (Cephalopoda Octopoda.) *Zool. Anz.*, 121, 223.
- Benham, W. B., 1942. The Octopodous Mollusca of New Zealand (1). The Midget Octopus of the Coastal Waters. *Trans. Roy. Soc. N.Z.*, 72, 226-236.
- Berry, S. S., 1917. Cephalopoda, *Austral. Ant. Exped. Sci. Rep. C.4*, 1-39.
- Berry, S. S., 1918. A. Postscript to the Cephalopoda of the Austral. Ant. Exped.
- Berry, S. S., 1918. B. Report on the Cephalopoda obtained by the F.I.S. "Endeavour" . . . *Biol. Res. of the Fish. Expts. F.I.S. "Endeavour"*, 4, 203-298.
- Carcelles, A. R. & Williamson, S. I., 1951. Catalogo de las Moluscos Marinos de la Provincia Magellanica. *Rev. Inst. Nac. Inv. Ciencias Nat.* 2, 225-383.
- Chun, C., 1906. System der Cranchien. *Zool. Anz.* 31, 82-86.
- Chun, C., 1910. Die Cephalopoden 1. Teil. Oegopsida. *Deutsche Tiefsee-Exped.*, 1898-1899, 18 (1), 410 pp.
- Cotton, B. C. and Godfrey, F. K., 1940. *The Molluscs of South Australia*, Part 2, Govt. Printer, Adelaide, 314 pp.
- Dell, R. K., 1951. A new species of Squid, *Histioteuthis cookiana* from New Zealand waters. *Zool. Publ. Vict. Univ. Coll.*, 14, 1-6.
- Dell, R. K., 1952. The Recent Cephalopoda of New Zealand. *Dominion Mus. Bull.* 16, 1-157.
- Ferussac, A. E., 1835. *Histoire Naturelle générale et particulière des Cephalopodes*. Paris.
- Hemming, F. (Ed.), 1953. *Copenhagen Decisions on Zoological Nomenclature*, London.
- Hoyle, W. E., 1885. Narrative Challenger Exped., 1.
- Hoyle, W. E., 1886. Report on the Cephalopoda collected by H.M.S. Challenger during the years 1873-76. *Challenger Rep.*, Zool., 16, 1-246.
- Hoyle, W. E., 1910. A List of the Generic Names of Dibranchiate Cephalopoda with their type species. *Abhandl. Sencken. Naturforsch. Gesell.* 32, 407-413.
- Hoyle, W. E., 1912. The Cephalopoda of the Scottish national Antarctic expedition. *Trans. Roy. Soc.*, Edinburgh, 48, 273-283.
- Joubin, L., 1903. Cephalopodes. *Resultats du Voyage du S.Y. "Belgica" en 1897-1898-1899* . . . Zoologie, 2 pp. Antwerp.
- Joubin, L., 1905. Description de deux Eledones provenant de l'Expédition du Dr. Charcot dans l'Antarctique. *Mem. Soc. Zool. Fr.*, 18, 22-31.
- Joubin, L., 1906. Cephalopodes, *Expéd. Antarct. Fr. (1903-05). Mollusques*.
- Joubin, L., 1914. Cephalopodes. *Deuxième Expéd. Ant. Fr. (1908-1910)*, 35-38.
- Joubin, L., 1924. Contributions à l'étude des Cephalopodes de l'Atlantique nord. *Rés. Camp. Scient* . . . Albert I. Monaco, Fasc. 67, 113 pp.
- Johnston, T. H., 1937. Biological Organisation and Station List. *B.A.N.Z.A.R.E. Rep.*, B, 1, 1-48.
- Lankester, E. R., 1884. On *Procalistes*, a young Cephalopod with Pedunculate Eyes, taken by the "Challenger" Expedition. *Quart. Journ. Micros. Sci.* (n.s.) 24, 311-318.
- Mackintosh, N. A., 1946. The Antarctic Convergence and the Distribution of Surface Temperatures in Antarctic Waters. *Discovery Rep.* 23, 179-211.
- Massy, A. L., 1916. Mollusca Part II—Cephalopoda. *Brit. Ant. ("Terra Nova") Exped.*, 1910, *Nat. Hist. Rep.*, Zool., 2, 141-176.
- Muus, B. J., 1956. Development and Distribution of a North Atlantic Pelagic Squid, Family Cranchiidae. *Medd. Danm. Fisk. Havunds* (n.s.) 1, 1-15.
- Odhner, N. H., 1923. Die Cephalopoden. *Further Zool. Res. Swed. Ant. Exped.*, 1901-1903, 1, 1-7.
- d'Orbigny, A., 1839 (in Ferussac & d'Orbigny) *Hist. Nat. Ceph. acét.* 1, 1-240.
- Pickford, G. E., 1955. A Revision of the Octopodinae in the Collections of the British Museum. Part 2—A Re-Examination of the specimens of *Robsonella fontaniana* in the Collections of the British Museum. *Bull. Brit. Mus. (Nat. Hist.) Zool.* 3, 163-167.
- Pfeffer, G., 1900. Synopsis der oegopsiden Cephalopoden. *Mitteil aus dem Naturhist. Mus.*, 17, 147-198.
- Pfeffer, G., 1912. Die Cephalopoden der Plankton-Expedition. *Ergeb. Plankton-Exped. Humboldt Stiftung*, 2.
- Powell, A. W. B., 1951. Antarctic and Subantarctic Mollusca. Pelecypoda and Gastropoda. *Discovery Rep.*, 26, 47-196.
- Robson, G. C., 1924. On the Cephalopoda obtained in South African Waters by Dr. J. D. F. Gilchrist in 1920-21. *Proc. Zool. Soc.* 1924, 589-686.
- Robson, G. C., 1929. *Monograph of Recent Cephalopoda*, Vol. 1, London. 236 pp.
- Robson, G. C., 1930. Cephalopoda, I. Octopoda. *Discovery Rep.*, 2, 371-402.
- Robson, G. C., 1932. *Monograph of Recent Cephalopoda*, Vol. 2, London. 359 pp.
- Robson, G. C., 1948. The Cephalopoda Decapoda of the "Arcturus" Oceanographic Expedition, 1925. *Zoologica*, 33, 115-132.
- Smith, A. E., 1903. *Rep. on Coll. of Nat. Hist. made* . . . "Southern Cross" Mollusca.
- Soot-Ryen, T., 1951. Antarctic Pelecypods. *Sci. Res. Norwegian Ant. Exped. 1927, 1928*, 32.
- Suter, H., 1913. *Manual of New Zealand Mollusca*, Govt. Printer, Wellington.
- Thiele, J., 1921. Die Cephalopoden der Deutschen Sud-polar-Expedition 1901-1902. *Deutsch. Sudpolar-Exped.* 16, 433-466.
- Thiele, J., 1934-35. *Handbuch der Systematischen Weichtierkunde* 2. Jena.
- Verany, J. B., 1851. Mollusques méditerranéennes. I Partie. Cephalopodes de la Méditerranée. Gènes.
- Verrill, A. E., 1882. Report on the Cephalopods of the northeastern coast of America. *U.S. Fish Comm. Rep. for 1879*, 211-455.
- Voss, G. L., 1956. A Review of the Cephalopods of the Gulf of Mexico. *Bull. Mar. Sci. Gulf. Caribbean*, 6, 85-178.

REPORTS OF B.A.N.Z. ANTARCTIC RESEARCH EXPEDITION, 1929-1931

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